REMARKS

Favorable reconsideration of this application in light of the following discussion is respectfully requested.

Claims 1-17 are pending in this application. Claims 1 and 16 are independent.

Summary

Applicants request the Examiner review the two paragraphs of the Summary section of Applicants' substitute specification reproduced below that explain the significance of the features of claim 1 emphasized in the following independent claims section.

Starting from a reconstruction method such as is described in [5], *instead of reconstructing entire image slices it is also possible to reconstruct the image voxels separately.* Then, data redundancies are processed by using methods that permit every arbitrary projection angular range that is greater than the required half revolution π.

One aspect which *is unique in at least one embodiment of the invention is the separate reconstruction of individual voxels. The projection data are weighted separately for approximate consideration of data redundancies for each individual voxel. The result of this is that, by contrast with the conventional back projection, instead of a filtered measured value being smeared along a line over all the voxels cut by the line, the measured value filtered for the voxel V is accumulated only on the voxel V.*

Independent Claims

Claim 1 is reproduced below for the Examiner's convenience and various features of the claim are emphasized.

1.   A method for generating images in computed tomography using 3D image reconstruction, the method comprising:

scanning an examination object by moving a focus on a spiral focal track about the examination object using a conical beam emanating from the focus and using a detector for detecting the beam, the detector supplying output data corresponding to the detected radiation; and

reconstructing image voxels from the scanned examination object from the output data and reproducing attenuation coefficients of the respective voxel, *each*

image voxel being reconstructed separately from projection data that include a
projection angular range of at least 180°, *whereby a measured value filtered for
each image voxel is accumulated only on the respective voxel*, and *an
approximate weighting taking place for each voxel considered in order to
normalize the projection data used relating to the respective voxel.*

Applicants respectfully submit that at least the above-emphasized features of independent claim

1 and the somewhat similar features of independent claim 16 patentably distinguish over the

cited references as detailed below.

Claim Rejections under 35 U.S.C. § 103

Claims 1, 2-4, 7, 8, 10-13, 16 and 17:

Claims 1, 2-4, 7, 8, 10-13, 16 and 17 stand rejected under 35 U.S.C. §103(a) as

unpatentable over Hu et al. (U.S. Patent No. 5,430,783, herein Hu) in view of Ning (U.S. Patent

No. 6,477,221) and in further view of Besson et al. (U.S. Patent No. 6,459,754, herein Besson).

Applicants respectfully traverse this rejection.

Arguments that Hu, Ning and Besson fails to disclose all features of claims 1 and 16:

Hu is directed towards a reconstruction method for helical scanning computed

tomography apparatus with a multi-row detector array employing overlapping beams. Hu

describes that an overlapping of measuring data occurs with a spiral scan, thereby causing

different voxels to be scanned multiple times. This additional scanning data are used for the

reconstruction. To avoid an over-evaluation of the multiple-scanned voxels, it is necessary to

introduce a corresponding weighting. However, a *voxel-specific* weighting is not described in

Hu.

Specifically, column 5, line 68 to column 6, line 1 of Hu states *"the present invention utilizes data from this extra scanning by weighting it and using it during the backprojection process on a voxel by voxel basis."* Accordingly, Hu only describes that there is a weighting of the utilized data (*The present invention utilizes data from this extra scanning by weighting it*) and that a backprojection process is to be realized on a "voxel by voxel basis" (*and using it during the backprojection process on a voxel by voxel basis*).

However, Hu does not disclose that the weighting *is voxel-specific*. Stated differently, the weighting does not refer to individual voxels. Thus, Hu does not describe the realization of a voxel-specific weighting or that the reconstruction is voxel-specific. The Examiner appears to share this opinion because otherwise there would be no need to also cite Ning and/or Besson. To cure the deficiencies of Hu, the Examiner relies on Ning and Besson.

The Examiner cites column 8, lines 8-10 of Ning. Applicants acknowledge that column 8, lines 8-10 states *"[I]n the reconstruction process, all voxels and projections are independent of one another, and rays can be backprojected independently."* This statement allegedly provides that a voxel-separate reconstruction of this type can be realized in combination with the method disclosed in Hu. However, Applicants note the following sentence states "[t]he operation for filtering and backprojection of *each projection* are independent; the low level multiplication and addition operation can even be divided independently." As such, the following sentence describes filtering and backprojection of each projection, and does not discuss voxels. Accordingly, the Examiner seems to overlook the context for this statement of Ning, wherein one skilled in the relevant art would of course take into account this context and the total content disclosed in Ning.

For example, the complete paragraph at column 8, lines 4-15 of Ning describes that the reconstruction processes can be run in parallel and on multi-processor systems because of their

mathematical independence. Ning therefore states that it is possible to realize known reconstruction processes faster on a multi-processor system. With respect to this, Ning describes in column 8, lines 4 to 10 that various forms of parallelization are possible with the "Feldkamp" algorithm, namely a pixel-type, a projection-type, a type using rays and an operational type parallelization. Ning explains this by stating that, in the reconstruction process, all voxels and projections are independent and that rays can be backprojected independently. Subsequently, Ning exclusively deals with the parallelization of fast Cone-Beam-Reconstructions, which do not point to the method recited in independent claim 1 and thus, Ning fails to cure the deficiencies of Hu with respect to claim 1.

Further, Applicants note that column 6, lines 14-15 of Ning states "[l]et the reconstruction volume be $N_x x N_y x N_z$ voxels in the x, y, and z direction." As such, this sentence seems to indicate each voxel is not reconstructed separately. In light of the above, Applicants submit that Ning like Hu fails to disclose, teach or suggest voxel-specific weighting or that the reconstruction is voxel-specific as is required by independent claim 1.

Column 1, lines 65-67 and column 6, line 64 of Besson is cited in the Office Action as teaching "each image voxel being reconstructed separately from projection data.[1]" Specifically, column 1, lines 65-67 of Besson states "[f]or each voxel in a reconstruction volume, it is necessary to compute, for each source position, a ray passing from the x-ray source through the voxel." Applicants note the cited portion does not describe voxel-specific weighting. Further, the quoted sentence appears to indicate that a reconstruction volume includes more than one voxel. As such, the quoted sentence does not appear to disclose a reconstruction that is voxel specific.

---

[1] Office Action mailed January 14, 2008, page 3, lines 5-7.

Further, column 6, line 64 of Besson states "reconstruction of a voxel M with a mult-slice detector 18, a ..." However, Applicants submit that even if this single sentence is considered as disclosing a voxel-specific reconstruction, which Applicants do not admit, there is no disclosure of voxel-specific weighting. Accordingly, Applicants submit that Besson does not cure all the deficiencies of Hu and/or Ning with respect to the features of independent claim 1.

As such, even if properly combinable, Hu, Ning and Besson at least fail to disclose, teach or suggest "*an approximate weighting taking place for each voxel considered in order to normalize the projection data used relating to the respective voxel,*" as required by claim 1, or the somewhat similar features of independent claim 16.

Arguments against combination of Hu, Ning and Besson:

The Office Action indicates that one skilled in the art would select the features from Ning and Besson to increase the processing speed of the system described in Hu. To be sure, it is correct that a processing speed is increased if the reconstruction is carried out with a plurality of parallel processes as mentioned by Ning. However, this does not coincide with the subject matter of Applicants' claim 1. On the contrary, the reconstruction method according to Applicants claim 1 may require an increased computation expenditure in light of the voxel-specific reconstruction and voxel-specific weighting. The motivation of the process acceleration therefore would *not* stimulate one skilled in the art to combine the features Hu, Ning and Besson. This motivation of accelerating the computation processes is mentioned only in Ning, while Besson does not disclose the computation time at any location.

On the whole, Applicants submit it is therefore not obvious that one skilled in the art would select precisely the features of Hu, Ning and Besson cited by the Examiner, and would combine the selected features precisely as required by Applicants' claim 1. Of Course, with an

"ex post factum" analysis it is almost always possible to extract individual method steps from the prior art and to combine these into a newly described process. However, that is not the view of one skilled in the art. If a method were to suggest itself in its totality at the point in time of invention to one skilled in the art, then concrete references from the prior art would be necessary to motivate him/her, on the one hand to leave out features from existing, closed methods and, on the other hand, to extract exactly those partial aspects from other and also closed functional methods and combine these features into the subject matter of the new method. This motivation does not follow from the cited references or knowledge of one skilled in the art at the time of filing of the Applicants' application.

In light of the above, Applicants request the rejection of independent claims 1 and 16, as well as claims 2-4, 7, 8, 10-13 and 17 depending therefrom, under 35 U.S.C. §103(a) be withdrawn.

Claims 5 and 14

Claims 5 and 14 stand rejected under U.S.C. §103(a) as unpatentable over Hu, Ning, Besson and Lai (U.S. Patent No. 6,118,841). Applicants respectfully traverse this rejection as detailed below.

Applicants respectfully submit that Lai fails to cure the deficiencies of Hu, Ning and Besson as described above with respect to independent claim 1 and thus, respectfully submit that dependent claims 5 and 14 are allowable over Hu, Ning, Besson and Lai for at least the same reasons that independent claim 1 is allowable over Hu, Ning and Besson.

Therefore, Applicants respectfully request that the rejection of claims 5 and 14 under 35 U.S.C. §103(a) be withdrawn.

Claims 6 and 15:

Claims 6 and 15 stand rejected under 35 U.S.C. §103(a) over Hu, Ning, Besson, Lai and Silver et al. (U.S. Publication No. 2003/0123614, herein Silver). Applicants respectfully traverse this rejection as detailed below.

Applicants respectfully submit that neither Lai nor Silver, either alone or in any proper combination, cure the deficiencies of Hu, Ning, and Besson as described above with respect to independent claim 1 and thus, respectfully submit that dependent claims 6 and 15 are allowable over Hu, Ning, Besson, Lai and Silver for at least the same reasons that independent claim 1 is allowable over Hu, Ning and Besson.

Therefore, Applicants respectfully request that the rejection of claims 6 and 15 be withdrawn.

Claim 9:

Claim 9 stands rejected under 35 U.S.C. §103(a) over Hu, Ning, Besson, and Gullberg et al. (IEEE Vol. 11, no. 1, June 1992, herein Gullberg). Applicants respectfully traverse this rejection as detailed below.

Applicants respectfully submit that Gullberg fails to cure the deficiencies of Hu, Ning and Besson as described above with respect to independent claim 1 and thus, respectfully submit that dependent claim 9 is allowable over Hu, Ning, Besson and Gullberg for at least the same reasons that independent claim 1 is allowable over Hu, Ning and Besson.

Therefore, Applicants respectfully request that the rejection of claim 9 be withdrawn.

CONCLUSION

Accordingly, in view of the above amendments and remarks, reconsideration of the rejections and allowance of each of pending claims of the present application is earnestly solicited.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Donald J. Daley at the telephone number of the undersigned below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

HARNESS, DICKEY, & PIERCE, P.L.C.

By _____
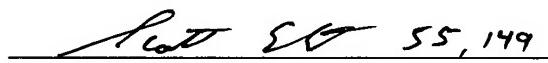
Donald J. Daley, Reg. No. 34,313

Scott A. Elchert, Reg. No. 55,149

P.O. Box 8910
Reston, Virginia 20195
(703) 668-8000

DJD/SAE/ame